The Advanced Distributed Learning (ADL) Initiative

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The Department of Defense (DoD) launched the Advanced Distributed Learning (ADL) initiative in November 1997. It is the most recent and visible initiative in a long campaign to incorporate the benefits of technology-based instruction and performance aiding in routine DoD practice.

ADL is intended to accelerate large-scale development of dynamic and cost-effective learning software and to stimulate a vigorous market for these products. Under Executive Orders issued by both the last and the current administrations, ADL is to develop and demonstrate capabilities that can be adopted by all federal agencies. It is establishing a common technical framework for computer and Web-based learning that will foster the creation of reusable learning content as "instructional objects".

The goal of the ADL initiative is to ensure access to high quality education and training, tailored to individual needs, developed and delivered cost-effectively, available anytime and anywhere. This goal is viewed as something that can be achieved affordably, and thereby made feasible, only through the use of technology—specifically computer technology.

The ADL Vision

The ADL initiative is based on the view of future education, training, and performance aiding illustrated in Figure 1 (see page 14). As the figure suggests, this view, or 'vision', keys on three main components:

- A global information infrastructure that is populated by reusable instructional objects
- A server that locates and then assembles instructional objects into education, training, and/or performance aiding materials tailored to user needs
- Devices that serve as personal learning associates on which the materials are presented to users.

At present personal digital assistants (PDAs), laptops, and other personal computing capabilities suffice for ADL needs.

Sharable Instructional Objects and Learning Management Systems

To date most ADL effort has been devoted to the specification of reusable, sharable instructional objects, which are essential in achieving the ADL long-term vision. These objects must be separated from context-specific run-time constraints and proprietary systems so that they can be incorporated into other applications. They should be:

- Durable, and not require modification as versions of system software change
- Interoperable, across a wide variety of hardware, operating systems and Web browsers
- Accessible, indexed and found as needed
- Reusable, so that different development tools can modify and use them.

The server shown in Figure 1 (see page 14) will assemble material on demand and in real time. Today, much of this work is accomplished by "middleware" in the form of learning management systems (LMSs). In ADL, an LMS knows what to deliver and when, and it tracks student progress through the learning content. The key function of an LMS in the ADL context is to manage content objects so that:

- A Web-based LMS can launch content that is authored using tools from different vendors

- Web-based LMS products from different vendors can launch the same content
- Multiple Web-based LMS products and environments can access a common repository of executable content.

The Sharable Content Reference Model (SCORM)

Specification of ADL instructional content objects is being accomplished through the development of the Sharable Content Object Reference Model (SCORM). The SCORM assumes a Web-based infrastructure as a basis for its technical implementation. The ADL initiative assumes that Web-based content can be delivered using nearly any other medium (e.g., CD-ROM, stand-alone systems and/or as networked environments).

Procedures for developing content objects must be articulated, accepted, and widely used as guidelines by developers and their customers. This goal can only be achieved through collaborative development. Such collaboration requires agreement upon a common reference model. The SCORM is intended to be such a model.

The SCORM has progressed through several versions, each building on and adding to earlier ones. The latest version can be viewed at the ADL website: www.adlnet.org. It covers such issues as the ADL run-time environment and the aggregation, packaging, and sequencing of instructional objects. Future versions will accommodate capabilities such as simulation, performance support, generative intelligent tutoring, and multiplayer online games.

Businesses in the content tool development industry have as much of a stake in the production of shareable courseware objects as DoD. They are doing much of the work required to create the SCORM. A primary function of the ADL initiative is to organize, encourage, orchestrate, and document their development efforts—and to ensure that defense education and training requirements are reflected in their work.

Co-Labs

The ADL initiative has established "Co-Laboratories" in Alexandria, Virginia, Orlando, Florida, and Madison, Wisconsin, to help achieve its vision. These Co-Labs help develop and test SCORM specifications and, more generally, determine how learning technologies can be best designed to bring about specific, targeted instructional outcomes reliably within as wide a range of instructional settings as possible.

The ADL Co-Laboratories developed the SCORM conformance test software, procedures, and supporting documents. The test software may be downloaded from the ADL website.

The Case for Technology

The case for ADL instruction and interactive ADL technology may be roughly summarized as the following:

- Tutorial instruction has been shown to increase learning over classroom instruction by as much as two standard deviations, roughly increasing the performance of fiftieth percentile students to the ninety-eighth percentile. Tutorial instruction may be an imperative for efficient learning, but it has been unaffordable because it requires one instructor for each student.
- ADL instruction and technology can, in many cases, make this instructional imperative affordable. Under any appreciable student load, it is less expensive to provide instruction with technology than to hire a sufficient number of tutors.
- Instruction using ADL technology has been found to be more effective than current instructional approaches in many settings across many subject matters. Analyses of the more than two-hundred and fifty empirical evaluations that have compared the use of ADL technologies with classroom instruction have shown improvements ranging from an average of 0.40 up to 1.05 standard deviations.
- ADL instruction is generally less costly than current instructional approaches, especially when many students or expensive devices are involved. Reductions in operating and support costs average about sixty-three percent. Savings in the time needed to achieve given instructional objectives average about thirty percent.
- ADL instruction is often the most cost-effective alternative for distributing instruction and for sustaining and enhancing the capabilities and readiness of military personnel after they are assigned to duty stations.
- ADL instruction will become increasingly affordable and instructionally effective with the development and use of standardized instructional objects. Early results indicate savings of about fifty percent.

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Overall, a rule of "thirds" emerges from assessments of instruction using ADL technologies. Their use reduces the cost of instruction by about one-third, and it either reduces time of instruction by about one-third or it increases the skills and knowledge acquired by about one-third.

The Server and Intelligent Tutoring Systems

An important technical challenge for the ADL initiative is construction of the Server shown in the middle of Figure 1. Help is on the way in the form of Intelligent Tutoring Systems (ITS).

"Intelligent" in the context of intelligent tutoring systems refers to the specific functionalities that are the goals of ITS development. They require ITS to generate instruction in real time and on demand as required by individual learners.

The ADL initiative and the development of ITS, then, have a number of key goals in common:

- Both are generative in that they envision the development of presentations on demand, in real time
- Both are intended to tailor content, sequence, level of difficulty, level of abstraction, style, etc. to users intentions, backgrounds, and needs
- Both can be used equally well to aid learning or decision making
- Both are intended to accommodate mixed initiative dialogue in which either the technology or the user can initiate or respond to inquiries in natural language
- Both will benefit greatly from a supply of sharable instructional objects readily available for the generation of instructional (or decision aiding) presentations.

Web Development and ADL

The World Wide Web has reset the development agenda for technology-based instruction development. It has established an ever-improving communications and delivery platform for accessing knowledge. Much of the development work once needed to adapt to the latest technology platform has been eliminated. The Web has become the universal delivery platform. It has freed learning system developers to focus on next-generation learning architectures. The emerging semantic Web, which along with its ontology will allow us to export any knowledge representation system onto the Web and link it to any other, will only strengthen this link—substantially.

Conclusion

The ADL initiative is intended to take advantage of the rapid growth of electronic commerce and the World Wide Web, and apply it to the needs of the learning community and life-long learners. It will help provide the learning resources that the DoD needs to ensure the operational effectiveness of its forces. It will help provide similar resources to all federal agencies, which also depend on human performance and competence. Cooperative development among all economic sectors—government, private industry, and academic—is needed and is being used to achieve the goals of the ADL initiative. ■

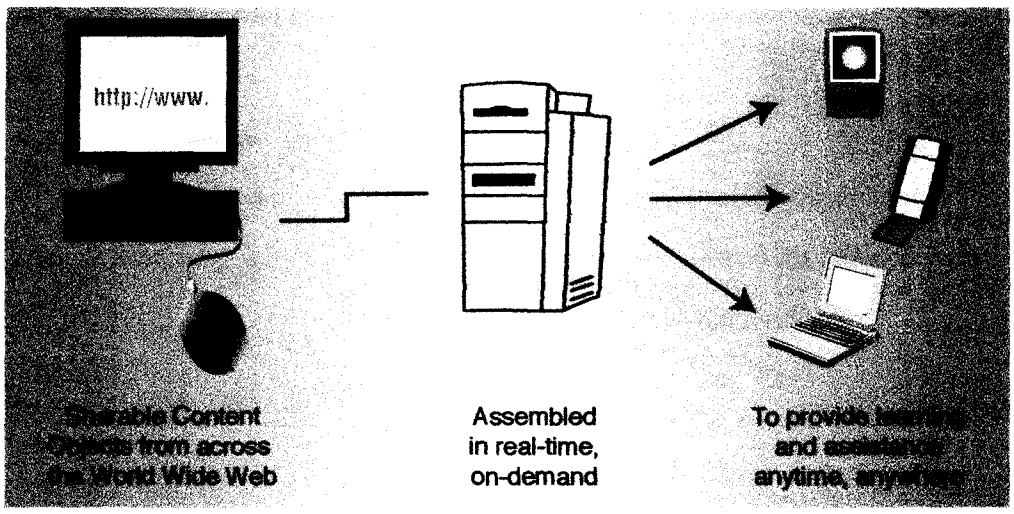

Figure 1. An Advanced Distributed Learning Future.